REMARKS

Claims 1-26 remain in the application as of the date of this amendment. No claims have been allowed.

Claims 5, 12, 19 and 25 are objected to because R_c was recited without proper antecedent basis. The disclosure is objected to because the disclosure at page 8, lines 26-27 with respect to R_c and R_0 does not coincide with what is shown in the originally-filed drawings.

These objections are respectfully traversed in view of the instant amendment. In reviewing the above-noted objections, Applicants recognized inconsistencies between the originally-filed FIGs. 2A-2D and the originally-filed specification. In particular, FIGs. 2A-2D clearly show that central circular region 18B has a radius of R_c and that single hole 19 has a radius of R_0. Accordingly, Applicants have amended the specification in several locations (to include the location noted by the Examiner) to coincide with what is shown in FIGs. 2A-2D. Applicants appreciate the Examiner's recognition of these inadvertent errors and apologize for any confusion and inconvenience they may have caused.

Claims 1-6, 8-11, 13, 15-19 and 21-24 are rejected under

35 U.S.C. 103(a) as being unpatentable over US 5,341,848 to Laws.

Claims 8-10 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,461,932 to Hall et al.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Laws in view of US 2,687,645 to Velten et al.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall et al. in view of Velten et al.

These rejections are respectfully traversed.

Laws appears to teach a flow conditioner plate having circular apertures arranged in a plurality of radially spaced circular arrays around a central aperture. The apertures in each array are equally spaced apart around the center of the plate, and all the apertures in one array are of substantially the same diameter. According to Laws' teachings, the size and number of apertures are such that the impedance to flow increases with the radius on which a given array of apertures is arranged. More specifically, a mathematical relationship defines a dependent interrelationship between attributes (i.e., an array's number of apertures and diameter thereof, and the plate

diameter at which an array's apertures are centered) associated with adjacent plate diameters. That is, the number of apertures and aperture diameters at one plate diameter has a direct impact on the number of apertures and aperture diameters at another plate diameter. See column 2, lines 32-46.

Hall et al. appear to teach a slotted orifice flowmeter that includes a plate having elongated openings arranged in a predetermined pattern such as the inner circle and outer annulus arrangement shown in FIG. 2. The mathematical relationship governing the combined area of the openings for the inner circle and outer annulus is recited in equation (1) and is explained at column 3, lines 13-23. Similar to Laws, the disclosed relationship in Hall et al. defines a dependent interrelationship between the combined area of openings for the inner circle and the combined area of openings for the outer annulus.

Velten et al. appear to teach an orifice plate having one set of elongate openings 17 arranged on a radius of the plate. This reference is silent as to how the openings are to be sized.

In contrast, Applicants teach and claim (for example in claim 1) a orifice plate comprising a plate adapted to be

positioned in a conduit and extend across a transverse cross-section thereof. The plate is defined by a central circular region having a radius R_C and a ring-shaped region surrounding the central circular region. The ring-shaped region has a plurality of holes formed therethrough with ones of the plurality of holes centered at each radius R of the ring-shaped region satisfying a flow-based relationship

$$A_R = a/(X_R V_R^b)$$

where A_R is a sum of areas of those of the plurality of holes having centers at radius R,

X_R is a flow coefficient at radius R that is equal to $(\rho K)_R$ where ρ_R is a density of a fluid that is to flow through the conduit at radius R and K_R is a flow correction factor associated with the fluid that is to flow through the conduit at radius R,

V_R is a velocity of the fluid that is to flow through the conduit at radius R,

b is a constant selected to make at least one process variable, associated with the fluid that is to flow through the conduit, approximately equal at each radius R, and

a is a constant that is equal to $(X_R A_R V_R^b)$ at each radius R.

None of the prior art, taken singly or in combination, appear to teach or even suggest Applicants' claimed orifice plate having a hole structure in which a plurality of holes

are provided at a number of radii of a ring-shaped region of the plate (i) with the holes associated with each radii satisfying a flow-based relationship, and (ii) such that one or more process variables (associated with a flow moving through the orifice plate) are approximately equal for each such radius. Thus, the area of the holes provided at any radius is independent (emphasis added) of the area of the holes associated with any other radius. This is because the structure of Applicants' orifice plate (governed by the disclosed and claimed flow-based relationship) is designed to balance at least one flow-related process variable across the plate.

In stark contrast, while Laws and Hall et al. teach orifice plates having hole patterns at multiple radii thereof, each of these references discloses a relationship governing the hole structure that makes the hole areas associated with adjacent radii mathematically dependent (emphasis added) on one another. Thus, it is respectfully submitted that Laws and Hall et al. teach away from Applicants' claimed structure and, therefore, do not render Applicants' claims obvious. Furthermore, since Velten et al. is silent as to any hole sizing relationships, it does not cure any of the above-noted deficiencies of the Laws and Hall et al. references.

In the rejections based on Laws and Hall et al., the Examiner indicated that it would have been an obvious matter of design choice to use Applicants' relationship with the teachings of Laws or Hall et al. "wherein it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art." At Applicants' request, the Examiner gave the cite of In re Boesch, 6,17 F.2d 272, 205 USPQ 215 (CCPA 1980) as the authority for this proposition.

Applicants respectfully disagree that this legal precedent is applicable in the instant situation. Boesch pertains to situations involving the use of a different percentage of a material constituent as compared to that recited in the prior art. That is, Boesch stands for the proposition that when the constituent is already disclosed in the prior art, it is deemed to be within the ordinary skill in the art to select a percentage of the same constituent that falls outside the percentage(s) disclosed by the prior art. However, in the instant situation, the structure of the prior art orifice plates are predicated on dependent relationships between holes located at different radii, whereas Applicants' hole structures at different radii of its ring-shaped region are independent of one another. In terms of the Boesch rationale, Applicants teach a completely different orifice plate structure that would be analogous to

the selection of a completely different material constituent as opposed to merely a different percentage of the same material constituent (as is the case in Boesch). Thus, it is respectfully submitted (i) that the Boesch precedent is not applicable to the instant application, and (ii) that both Laws and Hall et al. teach away from Applicants' claimed orifice plate while Velten et al. is silent with respect to any relationship governing hole size.

Accordingly, for all of the above reasons, it is respectfully submitted that Applicants' independent claims 1, 8, 15 and 21, as well as claims 2-7, 9-14, 16-20 and 22-26 as depending respectively therefrom, are patentable over the prior art.

In summary, claims 1-26 are in condition for allowance, and prompt notice of this is earnestly solicited.

Respectfully submitted,

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